Identifying Acquisition Framing Assumptions Through Structured Deliberation

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Preface

This report documents the structured process that was developed to help project teams identify acquisition framing assumptions. The first chapter introduces the process and describes the overall approach. The process begins in a workshop facilitated by a PowerPoint presentation. The slides from this presentation are shown in Chapter Two. This research was sponsored by the Performance Assessment and Root Cause Analysis (PARCA) office and conducted within the Acquisition and Technology Policy Center of the RAND National Defense Research Institute, a federally funded research and development center sponsored by the Office of the Secretary of Defense, the Joint Staff, the Unified Combatant Commands, the Navy, the Marine Corps, the defense agencies, and the defense Intelligence Community.

For more information on the RAND Acquisition and Technology Policy Center Center, see http://www.rand.org/nsrd/ndri/centers/atp.html or contact the director (contact information is provided on the web page).

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Abbreviations

AFSS	Air Force Space Surveillance System
APT	advanced pilot training
COTS	commercial off-the-shelf
DoD	Department of Defense
EELV	Evolved Expendable Launch Vehicle
FA	framing assumption
FMS	foreign military sales
FoS	family of systems
GOTS	government off-the-shelf
GPS	Global Positioning System
HMMWV	High Mobility Multi-Wheeled Vehicle
ILS	Instrument Landing System
JPALS	Joint Precision Approach and Landing System
JLTV	Joint Lightweight Tactical Vehicle
JV	joint venture
LCS	littoral combat ship
LEO	low earth orbit
MDAP	major defense acquisition program
MEO	middle earth orbit
OPN	other procurement, Navy

OSD	Office of the Secretary of Defense
PARCA	Performance Assessment and Root Cause Analyses
PEO	Program Executive Office
PM	program manager
RDA	research, development, and acquisition
SBIRS	Space Based Infrared System
SCN	shipbuilding and conversion, Navy
SSA	space situational awareness
SYSCOMS	Systems Command
TBD	to be determined
TSPR	Total Systems Performance Responsibility
VHF	very high frequency

CHAPTER ONE

Structured Process Guidance

Overview

Employment of acquisition framing assumptions (FAs) is an approach to defining and tracking key program assumptions that are made early in program development and throughout the program life. FAs serve as a form of risk analysis to identify uncertainties that may or may not be recognized as such. This document provides supporting information for the briefing titled "Identifying and Prioritizing Acquisition Framing Assumptions: Structured Deliberation Exercise"—a briefing to be used in a group setting to identify FAs. It also provides a brief introduction to the concept of FAs; an overview of the approach used in the briefing to identify FAs; and a discussion of how to operationalize this approach, including an overview of structured deliberation, some of the important concepts in having a successful session, and tailoring questions on program risk areas to help elucidate FAs. Note that the briefing is meant as a starting point and should be tailored to specific program circumstances.

Introduction to Framing Assumptions

In 2013, a RAND report included a definition of acquisition FAs along with a series of program examples.[1] This concept grew out of root cause analysis work by the Performance Assessment and Root Cause Analyses (PARCA) office on Nunn-McCurdy breaches on programs. Many of these breaches were associated with an incorrect or failing foundational assumptions—FAs. By making such FAs more explicit early in the program life cycle and tracking them, the Office of the Secretary of Defense (OSD), and the Services may be able to better manage major risks to and expectations of programs.

An FA is any explicit or implicit assumption that is central in shaping cost, schedule, or performance expectations. FAs may change over the course of execution or new

[1] Arena, Doll, and McKernan, 2013.

ones can be added. The PARCA office updated the criteria for FAs[2] as follows (italics in original):

- "*Critical: Significantly affects program expectations*. This criterion means that FAs, when they fail or are incorrect, will have significant cost, schedule and/or performance effects on the program. One possible consequence is a formal program breach. The criterion is meant to exclude the many smaller assumptions made for a program that do not result in significant consequences.
- *No workarounds: Consequences cannot be easily mitigated*. This criterion implies that valid FAs have no workarounds or potential fixes if they are wrong. The consequences of a failed FA will occur. When the FA is wrong, there will be significant cost and/or schedule implications.
- *Foundational: Not derivative of other assumptions*. This criterion is, perhaps, the hardest to understand and define. An FA is foundational if it is a high-level and encompassing assumption. An FA might have derivative assumptions associated with it, but a proper FA will not be derivative or subordinate to other major assumptions. The relationship between foundational and derivative assumptions can be exemplified by the F-35 program.[3] There were at least two important assumptions related to the program that later turned out to be incorrect. The first was that a high degree of concurrency between engineering and production was acceptable. The other was that testing would be more efficient than seen historically. However, these are both derivative assumptions of the true FAs. The foundational FAs were that the design technology was mature and that the competitive prototype was production representative.
- *Program specific: Not generally applicable to all programs.* This criterion implies that FAs should reflect some unique aspects of the program. For example, an FA is not, 'The contract will perform well.' However, an FA might be, 'The key technologies are sufficiently mature such that no component development or prototyping is necessary.'"

In the root cause research, we observed that FAs can be grouped into four major areas, shown in Table 1.1.

Several examples were identified of specific FAs that failed and contributed to Nunn-McCurdy breaches:

- Joint Strike Fighter (F-35)
  - Competitive prototypes are production representative (discussed above).

[2] Performance Assessment and Root Cause Analysis Office, 2013.

[3] Blickstein et al., 2011.

Table 1.1
FA Areas

Technological (Component/System Integration)	Management/ Program Structures	Mission Requirements	Cost and Schedule Expectations
Manufacturing expectations	Dependencies on other programs or development efforts	Stability of operational needs Quantity Capabilities Joint needs	Industrial base/market expectations
Testing expectations	Contractual incentive strategy/relationships	Possibility of a substitute system	Acquisition initiatives or targets
Technical approach	Organizational management structure	Understanding of threat levels	Unknown or undefined areas of scope (e.g., facilities locations, support approaches)
Risk expectations	Legal, diplomatic, or political issues	Flexibility based on changing intelligence	Experience of industry to execute
Use of simulation	Degree of "Jointness"		
Scale of integration	FMS possibilities		
COTS/GOTS suitability for application			
Reusability of legacy equipment or subsystems			
Technical maturity of components, system, and software			

  - The commonality between variants is high and will reduce development and production cost.
- Evolved Expendable Launch Vehicle (EELV)
  - The commercial launch marketplace is robust and can be leveraged for savings.
  - Government launch systems are flexible.
- Space Based Infrared System (SBIRS) High
  - Total Systems Performance Responsibility (TSPR) approach, managed by the contractor, is more effective than a traditional government-led management approach.
  - Software can be reused across development increments.
  - A form of incremental funding will yield large cost savings.

It is important to note that FAs are not necessarily a "bad" thing or incorrect. All programs make assumptions and many may turn out to be valid. The important point is that program outcomes are highly dependent on making the correct FAs. Also, one could go overboard in identifying framing assumptions. The concept is to develop a few concrete, high-level assumptions that can be easily tracked; on the order of three to five assumptions are a good amount for most programs.

The Three Phases of FA Identification

The process for identifying FAs involves three phases structured to occur in a linear manner: nomination, validation, and prioritization.

Phase 1: Candidate FA Nomination

In the nomination phase, candidate FAs are identified. This phase is meant to be one of idea generation, in which no candidate FA that is nominated is immediately dismissed. The goal is to obtain a robust list that will later be pared down using a set of eligibility criteria. This method is also known as brainstorming. It is important to have a mix of different people with different backgrounds participate (e.g., technologist, implementers, managers) so that a wide variety of ideas are put forward during the nomination phase.

Phase 2: Candidate FA Validation

In the validation phase, each candidate FA that was nominated is validated against three of the four criteria defined in PARCA's Information Paper,[4] namely, whether each candidate FA is foundational, program-specific, and without workarounds. Candidate FAs are eliminated if they do not meet any one of the three criteria. The goal is to determine the eligibility of those assumptions nominated as candidate FAs. The *candidate* FAs that have been validated become the program's *potential* FAs.

Phase 3: FA Prioritization

In the prioritization phase, each remaining potential FA is prioritized by its criticality. The goal of this phase is to rank the potential FAs to inform the selection of three to five FAs for the program. The program manager will likely make this selection of the final FAs.

Operationalizing the Approach Using a Structured Deliberation Process

The three phases outlined in the previous section are operationalized using a five-step structured group deliberation process. This section provides supporting information related to that process.

Why a Structured Approach?

The deliberation process set out in the briefing was selected for a number of reasons. First, a structured process allows the group to avoid some of the common drawbacks

[4] Performance Assessment and Root Cause Analysis Office, 2013.

of open-ended group idea-sharing processes. Since group members use the deliberation time both to generate their own ideas and to process the ideas of others, the two activities may compete with one another for a group member's attention and limit the beneficial effects of idea-sharing. To overcome this constraint, a structured process can, for instance, promote techniques for sharing written ideas. By having group members write down their ideas ahead of a group discussion, they do not have to wait their turn to generate and record ideas.[5] Writing down ideas ahead of time should not be construed as precluding group members from freely commenting on other members' contributions to the deliberation or from considering new ideas during the discussion. Both of these activities are encouraged as a part of the deliberation. Rather, initially writing down ideas will allow group members to generate their own initial ideas without the distractions that can occur during the group discussion. This activity is also helpful for mitigating a second drawback of unstructured group idea-sharing—that relevant information held by a minority of group members often fails to be introduced and given equal weight in the conversation.

A second motive for using a structured process is that it allows for better reproducibility, easier documentation, and more control. Although the candidate FAs that are originally nominated could differ if the group member composition were to change, the structured process will likely drive the final FAs to be quite similar. The structure also allows for a simple table (the FA Matrix) to act as documentation of the process. Finally, a structured process provides a facilitator with more control to consider minority viewpoints and explore all ideas.

Selecting Participants

The proper selection of participants for the group deliberation process is essential to the success of the process. Choosing a heterogeneous group of participants, with diverse backgrounds and a broad range of knowledge about the program, will ensure that all candidate FAs are considered. Furthermore, having a diverse group may reduce the tendency for the group to exhibit "confirmation bias" or the inclination to seek out only the information that confirms a specific viewpoint (and disregard information that disconfirms it).[6] Confirmation bias could lead to the incorrect elimination of an FA or validation of an ineligible FA.

Selecting a Facilitator

The group facilitator will play an important role in the group deliberation process—one of neutral leadership. Thus, he/she does not contribute to the content of the discussion or evaluate any ideas offered by group members but rather ensures that the content is within the proper scope of the discussion. The facilitator fosters the process

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5 Paulus and Yang, 2000.

6 Straus, Parker, and Bruce, 2011.

of group deliberation by keeping the discussion on track and making suggestions on how to proceed. He/she also ensures that everyone in the group has a chance to speak and that all ideas expressed by group members are included in the deliberation process and not immediately dismissed. While performing a leadership role, the ultimate goal of any facilitator should be that the group members could perform their deliberation without him/her. That is, the facilitator's role should be a passive one in the best scenario. Overall, a facilitator must strike a delicate balance between supporting the group deliberation process and not dictating its direction.

Choosing a facilitator for the group discussion helps to ensure that the structure set out in the briefing is followed. It also allows for a neutral voice that can mediate disagreements, ensure that the minority viewpoint is considered, and discourage discussion that is off task. The benefit of using a facilitator depends on the person selected to lead. That is, if the facilitator has a stake in the final outcome of the deliberation or has a strong predisposition, he/she may bias the result of the process. For this reason, it is advised that the program manager (PM) not be chosen as the facilitator. For instance, an appropriate choice of a facilitator may be someone who is not a part of the program office and therefore does not have a stake in the process.

Outline of Presentation

The main briefing (Slides 1–27) present an overview of the structured deliberation process and walks through the five steps in the process. Slides 1–5 introduce the process and gives an overview of the meeting objectives. Step 1 (Homework) takes place before the meeting where participants familiarize themselves with the concept of FAs and consider potential assumptions for their program. Also, a program overview should be provided to participants who are not actively working on the program to be read as a homework assignment before the deliberations. Alternatively, the PM could provide an overview briefing at the beginning of the session. Step 2 (Slides 7–13) reviews the concept of FAs and provides some case study examples for three programs (Slides 11–13). These case study examples can be tailored to suit the specific program being reviewed. Additional examples are provided as backup (Slides 41–44). Step 3, identifying candidate FAs, is presented in Slides 14–17. Step 4 (Slides 18–23) screens candidate FAs against the criteria defined by PARCA (see above). The final step, Step 5 (Slides 24–27), examines the surviving FAs' (now *potential* FAs) criticality and identifies potential tracking metrics. Slide 28 includes a blank template of the FA Matrix that the facilitator can use to document the deliberation process.

Slides 30–44 are backup slides. Slide 30 lists supporting references for the material in case the team wants to explore specific concepts in more depth. Slides 31–37 present a series of seed questions meant to stimulate discussion on unique or unusual aspects of the program. Answering "yes" to one of the questions does not necessarily mean that there is an FA for the program. The questions cover the four major themes for FAs so that all themes are considered. These questions could be tailored or modi-

fied depending on the program. For example, questions about production methods or technology may not be applicable to programs that are mainly software/information technology in nature. Slide 38 lists a series of additional questions to explore when considering candidate FAs. Slide 39 presents supporting questions when considering FA criticality. Slides 40–44 provide additional case study FA examples.

CHAPTER TWO

Slides

In this section, we reproduce the slides from the presentation.

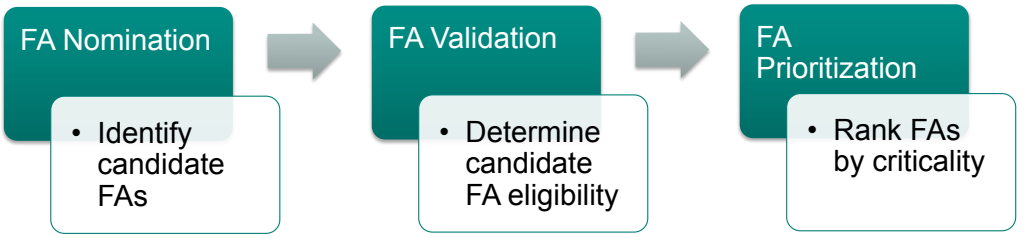
NATIONAL DEFENSE RESEARCH INSTITUTE

Identifying and Prioritizing Acquisition Framing Assumptions: Structured Deliberation Exercise

July 2014

Group Deliberation Goals

- **Objective**
  - **Identify and prioritize a set of major program assumptions**
- **Three phases:**



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Framing Assumptions Structured Deliberation Exercise - 2
Jan 2013

The Group Deliberation Exercise

- **Small interactive group exercise to stimulate creative idea generation**
- **Participants should:**
  - **Voice/record as many ideas as possible (regardless of their feasibility or unusual nature)**
  - **Withhold criticism or initial evaluation of ideas**
  - **Extend, add onto, combine and build upon other participants' ideas**
- **Some methods are better than others**
  - **Unrestricted group deliberation has been shown to be less effective than structured, written idea sharing**

Sources: Paulus and Yang, 2000; DeRosa, Smith, and Hantula, 2007.

Ground Rules for a Deliberation Session

- **Follow a semi-structured, systematic process**
- **Appoint a facilitator or group leader who does not have a stake in the outcome or strong predispositions; the facilitator should NOT be the program manager**
- **Gather a small, heterogeneous group**
- **Allow enough time in the session to properly explore all ideas**
- **Never immediately dismiss a new idea/minority viewpoint – understand its basis and potential consequences**
- **Keep an open mind and be willing to change initial opinions**
- **Use methods that allow all group members to state their opinion such as the sharing of individually written ideas**

Sources: Straus, Parker, and Bruce, 2011; Central Intelligence Agency, 2009; DeRosa, Smith, and Hantula, 2007.

Five Steps in the Deliberation Process

- **Step 1: "Homework": Read Informational Material (required), identify 3+ candidate FAs (optional)**
- **Step 2: Overview/Review of FAs and their importance**
- **Step 3: Identify candidate FAs (*Nomination*)**
- **Step 4: Determine eligibility (*Validation*)**
- **Step 5: Rank by criticality (*Prioritization*); identify metrics to track**

Step 1: "Homework" Read FA Info Paper and Program Background (required); Identify 3+ Candidate FAs (optional)

① Read FA Info Paper and FA questions (complete set in back-up slides) prior to meeting for deliberation
② Read program background
③ Group members come prepared to meeting with 3+ candidate FAs (optional)

Step 2: Overview of Framing Assumptions and Their Importance

① Definition of an FA and common FA themes
② Importance of FAs
③ Program example FAs

Definition of a "Framing Assumption"

- ***Framing assumption definition: Any explicit or implicit assumptions that are central in shaping cost, schedule, and/or performance expectations***
- ***Attributes of a framing assumption:***
  - **Critical: Assumption significantly affects program expectations (e.g., cost, schedule, performance).**
  - **No workarounds: The consequences of an incorrect FA cannot be easily mitigated. The effects are generally outside the project team's control.**
  - **Foundational: Not subordinate, derivative or linked to other assumptions. The FA may be composed of secondary assumptions, but it is independent from other major assumptions. It represents some central feature of the program.**
  - **Program specific: Not generically applicable to all programs.**
- ***Only a few, key framing assumptions per program***

A Framing Assumption is…	A Framing Assumption is not…
A unique aspect of contracting strategy (e.g., competitive prototyping)	The contractor will perform well
Weapon system to be replaced will last until a specified time	Program characteristic (e.g., family of systems)
Use of COTS/GOTS subsystems will save money	Program is affordable

Framing assumptions are not necessarily incorrect or "bad." However, they fundamentally shape program success – a bad assumption can result in significant challenges.

Common Framing Assumption Themes

Technological (Component / System Integration)	Management/ Program Structures	Mission Requirements	Cost and Schedule Expectations

• Manufacturing expectations
• Testing expectations
• Technical approach
• Risk expectations
• Use of simulation
• Scale of integration
• COTS/GOTS suitability for application
• Reusability of legacy equipment or subsystems
• Technical maturity of components, system, and software
	• Dependencies on other programs or development efforts
	• Contractual incentive strategy/ relationships
	• Organizational management structure
	• Legal, diplomatic, or political issues
	• Degree of "Jointness"
	• FMS possibilities
		• Stability of operational needs
		  • Quantity
		  • Capabilities
		  • Joint needs
		• Possibility of a substitute system
		• Understanding of threat levels
		• Flexibility based on changing intelligence
			• Industrial base/ market expectations
			• Acquisition initiatives or targets
			• Unknown or undefined areas of scope (e.g., facilities locations, support approaches)
			• Experience of industry to execute

Importance of FAs: Failed FAs Have Been Major Contributors to Nunn-McCurdy Breaches

- **Joint Strike Fighter (F-35)**
  - **Competitive prototypes are production representative**
  - **The commonality between variants is high and will reduce development and production cost**
- **EELV**
  - **The commercial launch marketplace is robust and can be leveraged for savings**
- **Space Based Infrared System (SBIRS) High**
  - **Total Systems Performance Responsibility (TSPR) approach, managed by the contractor, is more effective than traditional government-led approach**
  - **Software can be reused between increments**
  - **A form of incremental funding will yield large cost savings**

Advanced Pilot Training (APT) Family of Systems (FoS)

Service: **Air Force**

Program Type: **Pre-MDAP**

Commodity Type: **Aircraft and Ground Training System**

Description: **Expected to supply an advanced trainer, known as the T-X aircraft, for the fighter/bomber APT track as soon as 2017**

Technological	Management/ Program Structures	Mission Requirements	Cost and Schedule
• Training aircraft will be non-developmental (leverage commercial/foreign aircraft's capabilities) with minimal changes.	• Possible synergies with U.S. Navy and foreign militaries. (requirements align and minimal modifications required).	• Use of existing T-38 can be extended until 2020.	• Simulators can be used instead to reduce training flight time (to save money).

Joint Lightweight Tactical Vehicle (JLTV)

Service: **DoD (Army and Marine Corp)**

Program Type: **Pre-MDAP**

Commodity Type: **Ground Combat**

Description: **Will be a successor to the 11 different versions of the High Mobility, Multi-Wheeled Vehicle (HMMWV) that have been in service since 1985**

Technological	Management/ Program Structures	Mission Requirements	Cost and Schedule
• Open architecture approach will reduce risk and allow for more efficient upgrades.	• Joint Army and Marine Corps program will save money and requirements are compatible.	• Have effectively assessed long-term vs. short-term needs.	• Competitive prototyping will reduce risk/cost.

Joint Precision Approach and Landing System (JPALS)

Service: **Navy (with Air Force and Army support)**

Program Type: **MDAP**

Commodity Type: **Command and Control (Other)**

Description: **Global Positioning System (GPS)-based precision approach and landing system**

Technological	Management/ Program Structures	Mission Requirements	Cost and Schedule
• Modeling and simulation can be used to explore design tradeoffs.	• Navy is best service to lead acquisition due to their more demanding requirements.	• GPS constellation will be robust. • System is suitable for all types of air vehicles. • FAA will move to a GPS-based ILS.	• Ability to leverage COTS/GOTS hardware and software will lower cost.

Step 3: Identify Candidate Framing Assumptions

① Group members identify and individually record candidate FAs
② Facilitator lists candidate FAs in *FA Matrix*; group members present their FAs to the group
③ Facilitator leads limited discussion

① *Group Members Identify and Individually Record Candidate FAs*

- **Group members read seed questions – questions meant to raise issues that may lead to candidate FAs**
- **Members identify and record candidate FAs, along with a brief supporting explanation for each (these may be prepared ahead of time if Step 1 is implemented fully)**
- **The seed questions are drawn from each common FA theme; also include more general questions to help identify assumptions; examples include (see back-up slides for complete set):**
  - Technical: Have the technologies/types of software employed been used in a similar application, scale, or environment?
  - Management: Is the program's progress dependent on the progress of other programs? Is a new program management approach being adopted?
  - Requirements: Are the requirements stable and well defined?
  - Cost/schedule: Are there any significant savings initiatives/targets assumed?

② *Facilitator Lists Candidate FAs in FA Matrix; Members Present Their FAs to the Group*

- **Facilitator compiles all candidate FAs and lists in the first column of the FA Matrix, eliminating redundant FAs**
- **Members briefly present their candidate FAs to the group**

The FA Matrix

Candidate FA	Eligibility			Prioritize Criticality	Signposts/ metrics to monitor FA
	Program-specific?	No work-arounds?	Foundational?		
FA 1					
FA 2					
:					
:					
FA *n*					

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③ *Facilitator Leads Limited Discussion*

- **Facilitator leads a limited discussion to clarify or add additional candidate FAs**
- **Facilitator should ensure that all common FA themes are considered when compiling list of candidate FAs**
  - **Any missing FA themes should be revisited**
- **At this time group members*:**
  - **May ask for clarification and rewording of candidate FAs**
  - **Add any new candidate FAs that are uncovered during discussion**

*Group members should not discuss whether the candidate FA is *foundational, program-specific, critical,* or has *no workarounds*

Step 4: Determine Candidate FA Eligibility

① Are candidate FAs program-specific?
② Do candidate FAs have any workarounds?
③ Are candidate FAs foundational?

① Are Candidate FAs Program-Specific?

- **Facilitator leads a discussion about whether each candidate FA is program-specific?**
  - **The assumption is not generally applicable to all programs**
  - **The assumption is not a fundamental physical law or property - such as the gravitational constant.**
- **Group comes to consensus on whether each candidate FA is program-specific**
- **If candidate FA is determined to not be program-specific, it is eliminated from eligibility**

Candidate FA	Eligibility			Prioritize Criticality	Signposts/ metrics to monitor FA
	Program-specific?	No work-arounds?	Foundational?		
FA 1	**Yes**				
FA 2	**No**				
:	**Yes**				
:	**Yes**				
FA *n*	**Yes**				

② Do Candidate FAs Have Any Workarounds?

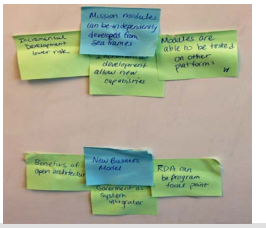
- **Facilitator leads discussion about whether each candidate FA has any workarounds; questions include:**
  - **Could any of the consequences be avoided through some other means?**
  - **Could the success of the program still be salvaged through some mitigating action?**
- **Group comes to consensus on whether each candidate FA has any workarounds**
- **If candidate FA is determined to have workarounds, it is eliminated from eligibility**

Candidate FA	Eligibility			Prioritize Criticality	Signposts/ metrics to monitor FA
	Program-specific?	No work-arounds?	Foundational?		
FA 1	**Yes**	**Yes**			
FA 2	**No**				
:	**Yes**	**Yes**			
:	**Yes**	**Yes**			
FA *n*	**Yes**	**No**			

③ Are Candidate FAs Foundational?

- Record all remaining candidate FAs on self-adhesive notes
- With minimal talking, move candidate FAs around into groupings
  - Groupings should reflect some aspect of similarity between FAs
  - Candidate FAs may be moved more than once by different individuals
  - If there is too much back-and-forth on a candidate FA, create a copy of it and place it in two categories
- For each grouping and remaining lone candidate FAs, identify other relevant candidate FAs:
  - Are there related assumptions that have not been identified yet?
  - Is there a new candidate FA that is central to all others in the grouping?
- Identify the foundational FA:
  - Are there similarities within a group?
  - Are some candidate FAs subordinate or a derivative of other FAs?
  - Is the candidate FA or grouping contingent on other events?
  - Does the candidate FA or grouping represent one or more aspects of a more general assumption?

Source: Institute for Healthcare Improvement, 2004.



***Green** notes: candidate FAs*
***Blue** notes: foundational FAs*

③ *Example Foundational and Subordinate Candidate FAs*

Littoral Combat Ship Modules (Navy mission systems program developing modules to execute a variety of missions)

- **Candidate FAs that may be grouped together:**
  - **Incremental development will allow new capabilities to be added easily**
  - **Modules are able to be tested on other ship platforms**
- **Foundational FA: Mission modules can be developed independently of sea frames**

FA Matrix with All Eligibility Items

Candidate FA	Eligibility			Prioritize Criticality	Signposts/ metrics to monitor FA
	Program-specific?	No work-arounds?	Foundational?		
FA 1	**Yes**	**Yes**	**No → FA 3**		
FA 2	**No**				
FA 3	**Yes**	**Yes**	**Yes**		
FA 4	**Yes**	**Yes**	**No**		
FA 5	**Yes**	**No**			
FA 6	**Yes**	**Yes**	**No → FA 3**		
FA 7	**Yes**	**Yes**	**No → New FA 11**		
FA 8	**Yes**	**Yes**	**No → New FA 11**		
FA 9	**Yes**	**Yes**	**Yes**		
FA 10	**Yes**	**Yes**	**Yes**		
New FA 11	**Yes**	**Yes**	**Yes**		

Step 5: Prioritize Potential FAs by Criticality; Identify Metrics to Track

① Determine criticality of potential FAs
② Determine signposts/metrics to monitor candidate FAs

② *Determine Signposts/Metrics to Monitor Potential FAs*

- **Facilitator leads discussion about signposts and metrics that could be used by the program to monitor the assumption; questions include:**
  - **What events or trends (i.e., signposts) would be expected to occur if this assumption was correct or incorrect?**
    - **How could these events/trends be measured and monitored?**
  - **What metrics could be used to track the validity of the FA?**
    - **Are there threshold values for these metrics that could signify a change in the assumption?**
- **Facilitator records ideas on the *FA Matrix***

Source: Central Intelligence Agency, 2009.

② *Determine Signposts/Metrics to Monitor Potential FAs*

- **Facilitator leads discussion about signposts and metrics that could be used by the program to monitor the assumption; questions include:**
  - **What events or trends (i.e., signposts) would be expected to occur if this assumption was correct or incorrect?**
    - **How could these events/trends be measured and monitored?**
  - **What metrics could be used to track the validity of the FA?**
    - **Are there threshold values for these metrics that could signify a change in the assumption?**
- **Facilitator records ideas on the *FA Matrix***

Source: Central Intelligence Agency, 2009.

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An Example of a Completed FA Matrix

Candidate FA	Eligibility			Prioritize Criticality	Signposts/ metrics to monitor FA
	Program-specific?	No work-arounds?	Foundational?		
FA 1	**Yes**	**Yes**	**No → FA 3**		
FA 2	**No**				
FA 3	**Yes**	**Yes**	**Yes**	2	Metric 1
FA 4	**Yes**	**Yes**	**No**		
FA 5	**Yes**	**No**			
FA 6	**Yes**	**Yes**	**No → FA 3**		
FA 7	**Yes**	**Yes**	**No → New FA 11**		
FA 8	**Yes**	**Yes**	**No → New FA 11**		
FA 9	**Yes**	**Yes**	**Yes**	3	Signpost a, b
FA 10	**Yes**	**Yes**	**Yes**	4	Signpost c
New FA 11	**Yes**	**Yes**	**Yes**	1	Metric 2, 3

FA Matrix Template

Candidate FA	Eligibility			Prioritize Criticality	Signposts/ metrics to monitor FA
	Program-specific?	No work-arounds?	Foundational?		

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Seed Questions

The next set of slides include the following seed questions

1. **Topical questions to help identify assumptions**
   - **Following common themes: Technical, Management, Requirements, Schedule/Cost**
   - **Answering yes to the question might indicate a possible FA for the program in that area. The questions should be tailored to the program**
2. **General questions to help identify assumption**
3. **Questions to assess criticality**

Technical Discussion Questions

- **Have the technologies employed been used in a similar application or environment?**
  - **Is there commercial technology that is being used for the first time in a military application? Who has the data rights?**
  - **Has the technology demonstrated successfully under the same operating conditions?**
  - **Has the reliability been demonstrated?**
- **Does the system depend on COTS solutions or other commercial technologies and services?**
  - **Is this a novel integration of standard systems?**
  - **Will these systems require modification for environment (e.g., shock, vibration, electromagnetic, and temperature)?**
  - **How long might the manufacturer support such an item? Will these services be available over the life of the system? Can the design adapt to component changes/upgrades?**
- **Is the commercial availability stable? Have all the technologies been demonstrated or successfully operated at the scale planned (e.g,. power density, number of sensors, bandwidth)?**
  - **How large a scale-up is planned?**
  - **Are there integration issues at this scale?**

Technical Questions (cont.)

- **Are there multiple systems/family of systems (FoS) that need to be integrated?**
  - **Have similar FoS been successfully integrated?**
- **Are there new manufacturing methods or techniques involved?**
- **Are there new or unusual materials involved?**
  - **Is the source of supply and price stable?**
- **Have prototypes been developed (or are planned) at the subcomponent or system level?**
  - **Do the prototypes represent something close to a production configuration?**
  - **Has the prototype effort resulted in reductions to cost and/or schedule?**
  - **Have the prototypes demonstrated needed technical maturity?**
- **Is the software development well understood?**
  - **What is the size of the overall programming effort?**
  - **How many lines of code per day can we expect? What error rate?**
  - **What are the assumptions around software reuse?**

Management Questions

- **Novel management structures**
  - **Is the government acting as system integrator?**
  - **Are multiple PEOs/PMs involved?**
  - **Do industry partners participate through new commercial partnerships or JVs?**
- **Is the program's progress dependent on the progress of other programs?**
- **Are there unique legal, diplomatic, or security issues?**
- **Does the program have an experienced workforce? Will there be issues retaining this workforce?**

Requirements Questions

- **Is there joint/foreign involvement?**
  - **Are the program requirements compatible between the stakeholders?**
  - **Does each participant require a customized version?**
  - **Is there uncertainty with respect to quantities for partners?**
- **Are the requirements stable and well defined?**
- **Will capability be met through an evolving design or series of upgrades?**
- **Is the need well understood (both from a capability sense and timing)?**
- **Are there unknown major areas of scope, e.g., facilities locations, operational availability, support equipment/infrastructure?**
- **Could another system substitute for this one?**
- **Do all the requirements need to be addressed for the program to be successful?**

Cost and Schedule Questions

- **Does the program rely on sole source(s)?**
- **Have the intellectual property rights been resolved?**
- **Are there workforce supply or demand issues? For instance, will the program contractor or vendor require significant hiring? Are key workforce skills/ trades in short supply? Can we hire at the rate based in our plans for that location?**
- **Is the stability of the vendors and suppliers base understood? Are there key suppliers who are at risk?**
- **Has the prime contractor executed a similar program (either in complexity or system/commodity type) before?**
- **Is there going to be a management reserve/should there be cost targets for the program?**
- **Has sufficient time been allowed to get the necessary approvals from OSD?**

Cost and Schedule Questions (cont.)

- **In the case of COTS products/solutions – is the commercial marketplace stable in terms of demand and pricing or is it cyclical? Can you obtain the data needed from the COTS supplier?**
- **Are there any significant savings initiatives/targets assumed?**
  - **What is the source of the savings?**
  - **Are they reasonable based on experience on existing or completed programs?**
- **Are there schedule pressures or tight deadlines to meet an IOC date?**
- **Is the testing plan adequate?**
  - **Is the time allotted comparable to previous efforts?**
  - **Is the number of test articles similar?**
  - **Is there a reliance on simulation to supplant some of the testing?**
  - **Does the test community have the capacity in the timeframe needed?**
  - **Is there particular test equipment needed? Does it need to be developed?**

General Questions to Identify Assumptions

Consider the following questions when determining potential framing assumptions from seed questions

- **Does information exist that:**
  - **Disconfirms or is contradictory to this judgment?**
  - **Was previously dismissed that might now be relevant to the topic?**
  - **Is new and could change this judgment? Has it been properly adjusted?**
- **How accurate and reliable is information upon which this judgment is based?**
  - **Was incomplete, imprecise, or ambiguous information used?**
- **Could certain circumstances (e.g., social, technological, economic, environmental, political, organizational) affect this judgment?**
  - **Does the judgment account for these circumstances? How sensitive is it to these circumstances?**
  - **Could circumstances proceed differently than expected?**
  - **For what circumstances would this judgment be abandoned?**
  - **Have all plausible but unpredictable circumstances been considered?**

Sources: Straus, Parker, and Bruce, 2011; CIA 2009; Kebell, Muller, and Martin, 2010.

Criticality Questions

- **If this assumption was incorrect:**
  - **To what degree would it affect the success of the program?**
    - **Could it delay the program schedule?**
    - **Could it change program requirements?**
    - **Could it affect program performance?**
    - **Could it directly increase program costs?**
  - **Could this result in other/multiple consequences to the program?**
- **Would changes in this assumption result in the contradiction of other identified assumptions?**

Source: Central Intelligence Agency, 2009.

Further Examples

Littoral Combat Ship (LCS) Mission Modules

- ***Service:*** **Navy**
- ***Program Type:*** **Pre-MDAP**
- ***Commodity Type:*** **Mission Systems**
- ***Description:***
  - **Provides Combatant Commanders assured access against littoral threats**
  - **Mission systems are added to the mission module baseline incrementally as they reach a level of maturity necessary for fielding**
  - **Uses evolutionary acquisition process**
  - **Provides an open architecture environment that enables future rapid insertion of new technologies**
- ***Last Milestone Awarded:*** **Milestone A (May 27, 2004)**

Sources: DAES (as of April 17, 2012) (FOUO); "LCS Mission Modules: Training Strategy Increasing Modularity for Maximum Adaptability Brief for Implementation Fest 2010" (August 10, 2010)

Littoral Combat Ship (LCS) Mission Modules

Technological	Management/ Program Structures	Mission Requirements	Cost and Schedule

• Independent development of sea frames and modules
  • Spiral/ incremental development will lower risk.
  • Ability to successfully test modules on other ship platforms.
  • New capabilities can be added easily.
	• New business model
	  • Benefits of open architecture/ commercial practices.
	  • Government suited to act as system integrator.
	  • RDA can be program focal point (4 PMs, 3 PEOs, 2 SYSCOMS).
		• Willingness of Navy to drop requirements (in spiral context) to keep to schedule.	• Modules can be funded OPN instead of SCN.

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Space Fence

- ***Service:*** **Air Force**
- ***Program Type:*** **Pre-MDAP**
- ***Commodity Type:*** **Radar**
- ***Description:***
  - **Provides a radar system operating in the S-band frequency band to replace the AFSSS VHF "Fence" radar that currently performs detection of orbiting space objects.**
  - **The S-band radar will have a modern, net-centric architecture that is capable of detecting much smaller objects in LEO/MEO.**
  - **The system will operate with greater accuracy and timeliness to meet warfighter requirements for SSA.**
  - **Two radar sites are planned, with locations TBD.**
- ***Last Milestone Awarded:*** **Milestone A (March 14, 2009)**

Sources: DAES (as of April 17, 2012) (FOUO); Mar 14, 2009 ADM (FOUO)

Space Fence

Technological	Management/ Program Structures	Mission Requirements	Cost and Schedule
• Capability is achievable despite some immature technologies at outset. • Can scale technology to track order of magnitude greater number of objects (radar components, software interoperability.	• Ease and implications of obtaining host nation agreement for siting. • Block approach a more effective acquisition strategy.	• Minimal manpower required to operate and support system. • Two of the original three sites will be sufficient.	• Competitive prototyping reduces risk and cost.

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This report documents the structured process that was developed to help project teams identify acquisition framing assumptions (FAs), which are useful in defining and tracking key program assumptions throughout the life of an acquisition program. The process begins with a workshop, in which a briefing is used to facilitate a deliberation with the aim of identifying candidate FAs. The report provides an introduction to the concept of FAs and an overview of the approach used in the briefing to identify FAs. It includes an overview of structured deliberation, some of the important concepts in having a successful session, and suggestions on how to tailor questions related to program risk areas to help elucidate FAs.

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